

December 2011 MSS/LPS/SPS Joint Subcommittee Meeting

ABSTRACT SUBMITTAL FORM

The submission of an abstract is an agreement to complete a final paper for publication and attend the meeting to present this information. Complete all information requested in the author and co-author information sections; the first author listed will receive paper acceptance notices and all correspondence. Abstracts must be submitted electronically; submittal instructions are located in the call for papers. **The abstract deadline date is June 13, 2011.**

ABSTRACT INFORMATION

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MANAGEMENT APPROVAL

The individual below certifies that the required resources are available to present this paper at the above subject JANNAF meeting.

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ABSTRACT SUBMITTAL FORM

Unclassified Abstract

(250-300 words; do not include figures or tables)

As part of an internal research and development project, NASA Marshall Space Flight Center (MSFC) has been developing a high specific impulse 9,000-lbf LOX/LH₂ pump-fed engine testbed with the capability to throttle 10:1. A Fuel Turbopump (FTP) with the ability to operate across a speed range of 30,000-rpm to 100,000-rpm was developed and analyzed. This small size and flight-like Fuel Turbopump has completed the design and analysis phase and is currently in the manufacturing phase. This paper highlights the manufacturing and processes efforts to fabricate an approximately 20-lb turbopump with small flow passages, intricately bladed components and approximately 3-in diameter impellers. As a result of the small scale and tight tolerances of the hardware on this turbopump, several unique manufacturing and material challenges were encountered. Some of the technologies highlighted in this paper include the use of powder metallurgy technology to manufacture small impellers, electron beam welding of a turbine blisk shroud, and casting challenges. The use of risk reduction efforts such as non-destructive testing (NDT) and evaluation (NDE), fractography, material testing, and component spin testing are also discussed in this paper.